

CSE- 1006 LAB Assignment 3.1

Academic year: 2021-2022 Semester: WIN

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Data Recoding:

Data Recoding in R can be done by either replacing data in an existing field or recoding into a new field based on criteria you specify

EXERCISES

Consider a numeric vector $x \leftarrow c(3,4,5,6,7,8)$

```
> x <- c(3,4,5,6,7,8)
```

Write a command to recode the values less than 6 with zero in the vector x

x[x<6]=0

```
> x[x<6]=0
[1] 0 0 0 6 7 8
```

Write a command to recode the values between 4 and 8 with 100

x[x>6 & x<8]=100

```
> x[x>6 & x<8]=100
                  6 100
```

Write a command to recode the values that are less than 5 or greater than 6 with 50



x[x<5 | x>6]<-50

```
> x[x<5 | x>6]<-50
> x
[1] 50 50 50 6 50 50
```

Write a command to recode the values less than 6 with NA in the vector x

x[x<6]<-NA

```
> x[x<6]<-NA
> x
[1] 50 50 50 6 50 50
```

Write a command to recode the values between 4 and 8 with NA

x[x>4 & x<8] <-NA

```
> x[x>4 & x<8] <-NA
> x
[1] 50 50 50 NA 50 50
```

Write a command to recode the values that are less than 5 or greater than 6 with NA

x[x<5 | x>6]<-NA

```
> x[x<5 | x>6]<-NA
> x
[1] NA NA NA NA NA NA NA
```

Count number of NA values after each operation

sum(is.na(x))

```
> sum(is.na(x))
[1] 6
```

Find mean of x (Hint: exclude NA values)

mean(x, na.rm=TRUE)

```
> mean(x, na.rm=TRUE)
[1] NaN
```

Find median of x (Hint: exclude NA values)



median(x, na.rm=TRUE)

```
> median(x, na.rm=TRUE)
[1] NA
```

Write a command to recode the values less than 6 with "NA" (enclose NA with double quotes) in the vector x

x=as.integer(x)

```
> x[x<6] <- "NA"
> x
[1] "NA" "NA" "NA" "6" "7" "8"
```

Write a command to recode the values between 4 and 8 with "NA"

```
> x[x>4 & x<8] <- "NA"
> x
[1] "3" "4" "NA" "NA" "NA" "8"
```

Write a command to recode the values that are less than 5 or greater than 6 with "NA"

```
> x <- c(3,4,5,6,7,8)
> x[x<5 | x>6]<- "NA"
> x
[1] "NA" "NA" "5" "6" "NA" "NA"
```

Count number of NA values after each operation

sum(is.na(x)) will not consider "NA" as it is a string

Find mean of x (Hint: exclude NA values)

Mean cannot be calculated as "NA" is a string

Find median of x (Hint: exclude NA values)

Median cannot be calculated as "NA" is a string

What is the difference between NA and "NA"

NA is not available (missing value) whereas "NA" is a string

EXERCISES



Consider the given vectors:

```
A <- c(3, 2, NA, 5, 3, 7, NA, NA, 5, 2, 6)

B <- c(3, 2, NA, 5, 3, 7, NA, "NA", 5, 2, 6)

> A <- c(3, 2, NA, 5, 3, 7, NA, NA, 5, 2, 6)

> B <- c(3, 2, NA, 5, 3, 7, NA, NA, 5, 2, 6)

> B <- c(3, 2, NA, 5, 3, 7, NA, "NA", 5, 2, 6)
```

Find the length of the vector A

```
> length(A)
[1] 11
```

Find the length of the vector B

```
> length(B)
[1] 11
```

Sort the values in vector A and put it in p (Hint: use function sort())

```
> p <- sort(A)
> p
[1] 2 2 3 3 5 5 6 7
```

Find the length of p

```
> length(p)
[1] 8
```

Sort the values in vector B and put it in q

```
> q <- sort(B)
> q
[1] "2" "2" "3" "3" "5" "5" "6" "7" "NA"
```

Find the length of q

```
> length(q)
[1] 9
```

What did you infer from the above results

EXERCISES

Let us work on dataset - airquality

```
> data(airquality)
```

Print the dataset airquality

```
> print(airquality)
   Ozone Solar.R Wind Temp Month Day
      41
            190 7.4
1
                      67
                              5
2
      36
             118 8.0
                       72
                              5
                                  2
3
      12
             149 12.6
                      74
                              5
                                  3
4
             313 11.5
                      62
      18
                                 4
5
             NA 14.3
                                 5
                       56
      NA
6
      28
             NA 14.9
                       66
                                 6
7
             299 8.6
                                 7
      23
                       65
                              5
     19
8
             99 13.8
                       59
                              5
                                 8
             19 20.1
9
      8
                       61
                              5
                                 9
                              5 10
10
             194 8.6
                       69
      NA
      7
             NA 6.9
                       74
                              5 11
11
             256 9.7
12
                       69
                              5 12
      16
             290 9.2
                              5 13
13
      11
                       66
             274 10.9
14
      14
                              5 14
                       68
             65 13.2
15
                              5 15
      18
                       58
                              5 16
             334 11.5
16
      14
                       64
             307 12.0
17
                              5 17
      34
                       66
18
             78 18.4
                       57
       6
                              5 18
19
             322 11.5
      30
                       68
                              5 19
             44 9.7
                              5 20
20
                       62
      11
              8 9.7
21
      1
                       59
                              5 21
22
                              5 22
      11
             320 16.6
                       73
                              5 23
23
              25 9.7
       4
                       61
             92 12.0
                              5 24
24
      32
                        61
25
                        57
                                 25
      NA
             66 16.6
                                 26
26
      NΑ
             266 14.9
                        58
                              5 27
              NA 8.0
27
                        57
      NA
```

Print the structure of the dataset airquality

```
> str(airquality)
'data.frame': 153 obs. of 6 variables:
$ Ozone : int 41 36 12 18 NA 28 23 19 8 NA ...
$ Solar.R: int
                190 118 149 313 NA NA 299 99 19 194 ...
$ Wind
        : num
                7.4 8 12.6 11.5 14.3 14.9 8.6 13.8 20.1 8.
6 ...
         : int
                67 72 74 62 56 66 65 59 61 69 ...
$ Temp
                5 5 5 5 5 5 5 5 5 5 ...
$ Month : int
        : int 1 2 3 4 5 6 7 8 9 10 ...
$ Day
```

Print the summary of all the variables of the dataset airquality (Hint: Use function summary())



```
> summary(airquality)
   Ozone Solar.R
Min. : 1.00 Min. : 7.0 Min. : 1.700
1st Qu.: 18.00 1st Qu.:115.8 1st Qu.: 7.400
Median: 31.50 Median: 205.0 Median: 9.700
Mean : 42.13 Mean :185.9 Mean : 9.958
3rd Qu.: 63.25 3rd Qu.:258.8 3rd Qu.:11.500
Max. :168.00 Max. :334.0 Max.
                                :20.700
    :37 NA'S :7
Temp Month
NA's
                             Day
Min. :56.00 Min. :5.000 Min. : 1.0
Median :79.00 Median :7.000 Median :16.0
Mean :77.88 Mean :6.993 Mean :15.8
3rd Qu.:85.00 3rd Qu.:8.000 3rd Qu.:23.0
Max. :97.00 Max. :9.000 Max. :31.0
```

How many of the variables (columns) are in the dataset airquality

How many observations (rows) are in the dataset airquality

```
> nrow(airquality)
[1] 153
```

Observe the results of summary() function on dataset airquality. Attributes Ozone and Solar.R have missing values. Number of missing values are displayed at the bottom of each column if any.

What are the values getting displayed when we use summary() function

What is quartile how to find them

What are 1st and 3rd quartiles

Copy the dataset airquality to aq (Better work on a copy of original data instead of working on original data to avoid the loss of information)

```
> aq <- airquality
>
```

Print the dataset aq

```
> print(aq)
> aq
                                        Ozone Solar.R Wind Temp Month Day
   Ozone Solar.R Wind Temp Month Day
                                          41
                                                 190 7.4
                                                            67
            190 7.4
1
      41
                     67
                            5
                               1
                                   2
                                                 118 8.0
                                           36
2
      36
            118 8.0
                     72
                               2
                            5
                                                                    5
                                   3
                                          12
                                                 149 12.6
                                                            74
            149 12.6
3
      12
                     74
                               3
                            5
                                                                    5
                                   4
                                          18
                                                  313 11.5
                                                            62
            313 11.5
4
                     62
      18
                            5
                                                                    5
                                                                       5
                                   5
                                          NA
                                                  NA 14.3
                                                             56
5
                               5
      NA
            NA 14.3
                     56
                            5
                                                                    5
                                           28
                                                  NA 14.9
                                                             66
                               6
6
      28
            NA 14.9
                     66
                            5
                                                                    5
                                                                       7
                                   7
                                          23
                                                 299 8.6
                                                             65
7
                               7
      23
            299 8.6
                     65
                            5
                                                                   5
                                                                       8
                                          19
                                                  99 13.8
                                                             59
8
                               8
     19
            99 13.8
                     59
                            5
                                                                   5
                                   9
                                          8
                                                  19 20.1
                                                             61
                                                                       9
9
     8
            19 20.1
                     61
                            5
                              9
                                                                   5
                                   10
                                          NA
                                                 194 8.6
                                                             69
                                                                      10
10
      NA
            194 8.6
                      69
                            5
                              10
                                                                   5
                                   11
                                          7
                                                  NA 6.9
                                                            74
                                                                      11
            NA 6.9
11
      7
                     74
                            5
                              11
                                                 256 9.7
                                   12
                                          16
                                                            69
                                                                      12
12
     16
            256 9.7
                     69
                            5
                              12
                                                 290 9.2
                                   13
                                          11
                                                            66
                                                                      13
13
     11
            290 9.2
                     66
                            5 13
                                   14
                                          14
                                                 274 10.9
                                                             68
14
     14
            274 10.9
                     68
                            5 14
                                   15
                                          18
                                                  65 13.2
                                                             58
                                                                      15
15
     18
            65 13.2
                     58
                            5 15
                                          14
                                                 334 11.5
                                                             64
                                                                      16
                                   16
16
     14
            334 11.5
                     64
                            5 16
                                   17
                                          34
                                                 307 12.0
                                                            66
                                                                   5 17
            307 12.0
17
      34
                      66
                            5 17
                                   18
                                          6
                                                  78 18.4
                                                             57
                                                                     18
18
      6
            78 18.4
                      57
                            5 18
                                           20
                                                             60
```

Print the structure of the dataset aq

```
> str(aq)
'data.frame': 153 obs. of 6 variables:
$ ozone : int 41 36 12 18 NA 28 23 19 8 NA ...
$ solar.R: int 190 118 149 313 NA NA 299 99 19 194 ...
$ wind : num 7.4 8 12.6 11.5 14.3 14.9 8.6 13.8 20.1 8.6 ...
$ Temp : int 67 72 74 62 56 66 65 59 61 69 ...
$ Month : int 5 5 5 5 5 5 5 5 5 ...
$ Day : int 1 2 3 4 5 6 7 8 9 10 ...
```

Print the summary of all the variables of the dataset aq (Hint: Use function summary())



> summary(aq) Wind Ozone Solar.R Min. : 1.00 Min. : 7.0 Min. : 1.700 Median : 31.50 Median :205.0 Median : 9.700 Mean : 42.13 Mean :185.9 Mean : 9.958 3rd Qu.: 63.25 3rd Qu.:258.8 3rd Qu.:11.500 Max. :168.00 Max. :334.0 Max. :20.700 :37 NA's NA's :7 Temp Month Day Min. :56.00 Min. :5.000 Min. : 1.0 Median :79.00 Median :7.000 Median :16.0 Mean :77.88 Mean :6.993 Mean :15.8 3rd Qu.:85.00 3rd Qu.:8.000 3rd Qu.:23.0 Max. :97.00 Max. :9.000 Max. :31.0

Print top 6 observations

>	head(a	aq)				
	Ozone	Solar.R	Wind	Temp	Month	Day
1	41	190	7.4	67	5	1
2	36	118	8.0	72	5	2
3	12	149	12.6	74	5	3
4	18	313	11.5	62	5	4
5	NA	NA	14.3	56	5	5
6	28	NA	14.9	66	5	6

Print last 6 observations

> tail(aq)						
	Ozone	Solar.R	Wind	Temp	Month	Day
148	14	20	16.6	63	9	25
149	30	193	6.9	70	9	26
150	NA	145	13.2	77	9	27
151	14	191	14.3	75	9	28
152	18	131	8.0	76	9	29
153	20	223	11.5	68	9	30

Replace the NA values in the attribute Ozone in aq by zero

```
> aq[is.na(aq)] <- 0</pre>
```

Print the summary of all the variables of the dataset aq





```
> summary(aq)
                   Solar.R
    Ozone
                                      Wind
Min. : 0.00 Min. : 0.0 Min. : 1.700
1st Qu.: 4.00 1st Qu.: 95.0 1st Qu.: 7.400
Median : 21.00 Median :194.0 Median : 9.700
Mean : 31.94 Mean :177.4 Mean : 9.958
 3rd Qu.: 46.00 3rd Qu.:256.0 3rd Qu.:11.500
Max. :168.00 Max. :334.0 Max. :20.700
     Temp Month
                                Day
Min. :56.00 Min. :5.000 Min. : 1.0
1st Qu.:72.00 1st Qu.:6.000 1st Qu.: 8.0
Median :79.00 Median :7.000 Median :16.0
Mean :77.88 Mean :6.993 Mean :15.8
 3rd Qu.:85.00 3rd Qu.:8.000 3rd Qu.:23.0
Max. :97.00 Max. :9.000 Max. :31.0
```

Replace the NA values in the attribute Ozone in aq by mean of the remaining values. Print the summary of the dataset aq

```
> summary(airquality$0zone)
  Min. 1st Qu. Median Mean 3rd Qu.
                                    Max.
                                            NA's
  1.00 18.00
               31.50
                      42.13 63.25 168.00
                                              37
> aq$Ozone[is.na(aq$Ozone)] <- mean(airquality$Ozone, na.rm = TRUE)</p>
> summary(aq$0zone)
  Min. 1st Qu. Median Mean 3rd Qu.
  0.00 4.00
              21.00
                      31.94 46.00 168.00
> summary(aq)
    Ozone
                 Solar.R
                                 Wind
Min. : 0.00 Min. : 0.0 Min. : 1.700
1st Qu.: 4.00 1st Qu.: 95.0 1st Qu.: 7.400
Median: 21.00 Median: 194.0 Median: 9.700
Mean : 31.94 Mean :177.4 Mean : 9.958
3rd Qu.: 46.00 3rd Qu.:256.0 3rd Qu.:11.500
Max. :168.00 Max. :334.0
                             Max. :20.700
     Temp Month
                            Day
Min. :56.00 Min. :5.000 Min. : 1.0
1st Qu.:72.00 1st Qu.:6.000 1st Qu.: 8.0
Median :79.00 Median :7.000 Median :16.0
Mean :77.88 Mean :6.993 Mean :15.8
3rd Qu.:85.00 3rd Qu.:8.000 3rd Qu.:23.0
Max. :97.00 Max. :9.000 Max. :31.0
```

Copy the dataset airquality to aq1. Replace the NA values in the attribute Ozone in aq1 by median of the remaining values. Print the summary of the dataset aq1

```
> aq1 <- airquality
>
```



```
> aq1$0zone[is.na(aq$0zone)] <- median(aq1$0zone, na.rm = TRUE)
> summary(aq1$0zone)
   Min. 1st Qu. Median Mean 3rd Qu.
                                                 NA's
   1.00 18.00
                31.50
                         42.13 63.25 168.00
> aq1$0zone[is.na(aq$0zone)] <- median(aq1$0zone, na.rm = TRUE)</pre>
> summary(aq1$0zone)
   Min. 1st Qu. Median
                                                 NA's
                         Mean 3rd Qu.
                        42.13 63.25 168.00
   1.00
        18.00
                31.50
                                                   37
> aq1$0zone[is.na(aq1$0zone)] <- median(aq1$0zone, na.rm = TRUE)</pre>
> summary(aq1$0zone)
  Min. 1st Qu. Median
                         Mean 3rd Qu.
                                         мах.
   1.00 21.00 31.50
                         39.56 46.00 168.00
```

Copy the dataset airquality to aq2. Replace the NA values in the attribute Ozone in aq2 by mode of the remaining values. Print the summary of the dataset aq2

```
> aq2 <- airquality
>
```

Repeat the above five operations for the attribute Solar.R

Replace all the values of Temp with global constant 50 in aq1

Replace all the values below 60 of Temp with global constant 60 in aq2

Replace the month numbers in the column Month in aq by name of the month. (Ex: Replace 5

with May). (Hint: use gsub() function. aq\$Month <- gsub(5,"May",aq\$Month))

Create a new logical attribute Solar.Danger in aq by filling it's value with TRUE if the value in the attribute Solar.R is greater than 100, other with FALSE

Discretize the values in Temp of aq to "Low", "Medium" and "High"

What does cut() function do?

Create a numeric vector brks containing values 0, 50, 100, 200, 250, 300 and 350. Divide the range of Solar.R into intervals and recode the values in Solar.R according to which interval they fall using the vector brks.

aq\$Solar.R=cut(aq\$Solar.R,breaks=brks,include.lowest=TRUE)

Practice the examples given in lecture slide 12 on dataset airquality

```
52
          150 6.3 77
                       6 21
    NA
53
    NA
          59 1.7 76
                      6 22
54
    NA
          91 4.6 76
                      6 23
55
    NA
         250 6.3
                 76
                       6 24
56
    NA
          135 8.0 75
                       6 25
                       6 26
57
          127 8.0 78
    NA
58
          47 10.3 73
                       6 27
    NA
59
    NA
          98 11.5 80
                       6 28
60
    NA
          31 14.9 77
                       6 29
61
    NA
         138 8.0 83
                       6 30
62
    135
         269 4.1 84
                       7 1
63
    49
         248 9.2 85
                      7 2
```



```
7 3
64
    32
         236 9.2 81
65
    NA
         101 10.9 84
                        7 4
66
         175 4.6 83
                       7 5
    64
67
    40
         314 10.9 83
                       7 6
68
         276 5.1 88
                       7 7
    77
69
    97
         267 6.3 92
                       7 8
70
         272 5.7 92
    97
                       7 9
71
    85
         175 7.4 89
                       7 10
72
    NA
         139 8.6 82
                       7 11
73
         264 14.3 73
                       7 12
    10
         175 14.9 81
74
    27
                       7 13
75
         291 14.9 91
                        7 14
    NA
76
     7
         48 14.3 80
                      7 15
77
    48
         260 6.9 81
                       7 16
78
         274 10.3 82
                       7 17
    35
79
         285 6.3 84
                       7 18
    61
80
    79
         187 5.1 87
                       7 19
81
    63
         220 11.5 85
                       7 20
82
          7 6.9 74
    16
                      7 21
83
    NA
          258 9.7 81
                       7 22
    NA
          295 11.5 82
                        7 23
84
         294 8.6 86
                       7 24
85
    80
86
    108
          223 8.0 85
                       7 25
87
    20
          81 8.6 82
                      7 26
88
    52
          82 12.0 86
                       7 27
89
    82
         213 7.4 88
                       7 28
90
    50
         275 7.4 86
                       7 29
91
         253 7.4 83
                       7 30
    64
92
    59
         254 9.2 81
                       7 31
93
    39
          83 6.9 81
                       8
                         1
94
     9
         24 13.8 81
                         2
                       8
95
          77 7.4 82
    16
                       8
                         3
96
    78
          NA 6.9 86
                       8
                         4
97
    35
          NA 7.4 85
                       8
                         5
98
    66
          NA 4.6 87
                       8 6
    122
          255 4.0 89
99
                        8 7
                        8 8
100
    89
          229 10.3 90
          207 8.0 90
101
    110
                        8 9
102
     NA
          222 8.6 92
                        8 10
103
     NA
          137 11.5 86
                        8 11
104
          192 11.5 86
     44
                        8 12
105
     28
          273 11.5 82
                        8 13
106
          157 9.7 80
     65
                        8 14
          64 11.5 79
107
     NA
                        8 15
108
          71 10.3 77
     22
                       8 16
109
     59
          51 6.3 79
                       8 17
110 23
          115 7.4 76
                       8 18
111
     31
         244 10.9 78
                        8 19
```



```
112
     44
          190 10.3 78
                       8 20
113
     21
          259 15.5 77
                       8 21
114
     9
          36 14.3 72
                      8 22
115 NA
          255 12.6 75
                        8 23
116
     45
          212 9.7 79
                       8 24
                       8 25
117
    168
          238 3.4 81
118
    73
          215 8.0 86
                       8 26
119 NA
          153 5.7 88
                       8 27
120
    76
          203 9.7 97
                       8 28
121 118
          225 2.3 94
                       8 29
122
          237 6.3 96
    84
                       8 30
123
     85
          188 6.3 94
                       8 31
124
     96
          167 6.9 91
                       9 1
125
    78
          197 5.1 92
                       9 2
126
     73
          183 2.8 93
                       9 3
127
     91
          189 4.6 93
                       9 4
128
     47
          95 7.4 87
                       9 5
129
     32
          92 15.5 84
                       9 6
130
     20
          252 10.9 80
                       9 7
131
     23
          220 10.3 78
                        9 8
132
     21
          230 10.9 75
                       9 9
133
     24
          259 9.7 73
                       9 10
134
     44
          236 14.9 81
                        9 11
135
     21
          259 15.5 76
                       9 12
136
     28
          238 6.3 77
                       9 13
137
     9
          24 10.9 71
                       9 14
138
     13
          112 11.5 71
                       9 15
139
     46
          237 6.9 78
                       9 16
140
     18
          224 13.8 67
                       9 17
141
          27 10.3 76
                       9 18
     13
142
     24
          238 10.3 68
                       9 19
143
     16
          201 8.0 82
                       9 20
144
     13
          238 12.6 64
                       9 21
145
     23
          14 9.2 71
                       9 22
146
     36
          139 10.3 81
                       9 23
147
          49 10.3 69
                       9 24
     7
148
     14
          20 16.6 63
                       9 25
149
     30
          193 6.9 70
                       9 26
150
     NA
          145 13.2 77
                        9 27
151
     14
          191 14.3 75
                       9 28
152
    18
          131 8.0 76
                       9 29
153
     20
          223 11.5 68
                       9 30
```

> str(airquality)

'data.frame': 153 obs. of 6 variables:

\$ Ozone: int 41 36 12 18 NA 28 23 19 8 NA ...

\$ Solar.R: int 190 118 149 313 NA NA 299 99 19 194 ... \$ Wind : num 7.4 8 12.6 11.5 14.3 14.9 8.6 13.8 20.1 8.6 ...

\$ Temp : int 67 72 74 62 56 66 65 59 61 69 ...



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$ Month: int 5555555555...
$ Day : int 1 2 3 4 5 6 7 8 9 10 ...
>
> summary()
Error in is.factor(object):
 argument "object" is missing, with no default
> summary(airquality)
  Ozone
              Solar.R
                           Wind
Min.: 1.00 Min.: 7.0 Min.: 1.700
1st Qu.: 18.00 1st Qu.:115.8 1st Qu.: 7.400
Median: 31.50 Median: 205.0 Median: 9.700
Mean: 42.13 Mean: 185.9 Mean: 9.958
3rd Qu.: 63.25 3rd Qu.:258.8 3rd Qu.:11.500
Max. :168.00 Max. :334.0 Max. :20.700
NA's :37
            NA's :7
   Temp
              Month
                          Day
Min. :56.00 Min. :5.000 Min. : 1.0
1st Qu.:72.00 1st Qu.:6.000 1st Qu.: 8.0
Median: 79.00 Median: 7.000 Median: 16.0
Mean :77.88 Mean :6.993 Mean :15.8
3rd Qu.:85.00 3rd Qu.:8.000 3rd Qu.:23.0
Max. :97.00 Max. :9.000 Max. :31.0
>
>
>
>
> summary(airquality)
  Ozone
              Solar.R
                           Wind
Min.: 1.00 Min.: 7.0 Min.: 1.700
1st Qu.: 18.00 1st Qu.:115.8 1st Qu.: 7.400
Median: 31.50 Median: 205.0 Median: 9.700
Mean: 42.13 Mean: 185.9 Mean: 9.958
3rd Qu.: 63.25 3rd Qu.:258.8 3rd Qu.:11.500
Max. :168.00 Max. :334.0 Max. :20.700
NA's :37
            NA's :7
   Temp
              Month
                          Dav
Min. :56.00 Min. :5.000 Min. : 1.0
1st Qu.:72.00 1st Qu.:6.000 1st Qu.: 8.0
Median: 79.00 Median: 7.000 Median: 16.0
Mean :77.88 Mean :6.993 Mean :15.8
3rd Qu.:85.00 3rd Qu.:8.000 3rd Qu.:23.0
Max. :97.00 Max. :9.000 Max. :31.0
```

19BCE7346



```
> ncol(airquality)
[1] 6
>
> nrow(airquality)
[1] 153
>
>
>
> head(airqua;ity)
Error: unexpected ';' in "head(airqua;"
> head(airquaity)
Error in head(airquaity): object 'airquaity' not found
> head(airquality)
 Ozone Solar.R Wind Temp Month Day
  41
1
       190 7.4 67 5 1
2
   36
                     5 2
       118 8.0 72
3 12 149 12.6 74 5 3
4 18 313 11.5 62 5 4
5 NA NA 14.3 56 5 5
6 28 NA 14.9 66 5 6
>
>
>
>
> head(airquality)
 Ozone Solar.R Wind Temp Month Day
       190 7.4 67
                     5 1
2 36
                     5 2
      118 8.0 72
3 12 149 12.6 74 5 3
4 18 313 11.5 62 5 4
5 NA NA 14.3 56 5 5
6
  28
        NA 14.9 66 5 6
>
> x[x<6]=0
>
>
>
>
>
>
>
> x
[1] 0 0 0 6 7 8
>
>
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> x[x<6]=0

> x

[1] 0 0 0 6 7 8



```
> x[x>6 & x<8]=100
> x
[1] 0 0 0 6 100 8
> x[x<5 | x>6]<-50
> x
[1] 50 50 50 6 50 50
> x[x<6]<-NA
[1] 50 50 50 6 50 50
> x[x>4 \& x<8] <-NA
> x
[1] 50 50 50 NA 50 50
> x[x<5 | x>6]<-NA
> x
[1] NA NA NA NA NA NA
> sum(is.na(x))
[1] 6
> mean(x, na.rm=TRUE)
[1] NaN
> median(x, na.rm=TRUE)
[1] NA
> x[x<6]<-"NA"
[1] NA NA NA NA NA NA
> x=as.integer(x)
>
> x
[1] NA NA NA NA NA NA
> x=as.integer(x)
> x
[1] NA NA NA NA NA NA
>
> x[x<6]<-"NA"
[1] NA NA NA NA NA NA
> x=as.integer(x)
```



```
> x
[1] NA NA NA NA NA NA
> A <- c(3, 2, NA, 5, 3, 7, NA, NA, 5, 2, 6)
>
>
>
>
>
> A <- c(3, 2, NA, 5, 3, 7, NA, NA, 5, 2, 6)
> B <- c(3, 2, NA, 5, 3, 7, NA, "NA", 5, 2, 6)
Error: unexpected input in "B <- c(3, 2, NA, 5, 3, 7, NA, ""
> length(A)
[1] 11
> length(B)
Error: object 'B' not found
> B <- c(3, 2, NA, 5, 3, 7, NA, "NA", 5, 2, 6)
>
>
>
>
>
>
>
> A <- c(3, 2, NA, 5, 3, 7, NA, NA, 5, 2, 6)
> B <- c(3, 2, NA, 5, 3, 7, NA, "NA", 5, 2, 6)
> length(A)
[1] 11
> length(B)
[1] 11
>
>
> p <- sort(A)
>
> p
[1] 2 2 3 3 5 5 6 7
>
> p <- sort(A)
> p
[1] 2 2 3 3 5 5 6 7
> length(p)
[1] 8
```



```
> q <- sort(B)
> q
[1] "2" "2" "3" "3" "5" "5" "6" "7" "NA"
> length(q)
[1] 9
> x <- c(3,4,5,6,7,8)
> x=as.integer(x)
[1] 3 4 5 6 7 8
>
> x[x<6] <- "NA"
> x
[1] "NA" "NA" "NA" "6" "7" "8"
> x=as.integer(x)
Warning message:
NAs introduced by coercion
>
>
> airquality {datasets}
Error: unexpected '{' in "airquality {"
>
>
> aq <- airquality
>
> aq
  Ozone Solar.R Wind Temp Month Day
1
    41
         190 7.4 67
                      5 1
2
         118 8.0 72
    36
                      5 2
3
    12
         149 12.6 74
                       5 3
4
    18
         313 11.5 62
                       5 4
5
    NA
        NA 14.3 56 5 5
6
    28
         NA 14.9 66
                      5 6
7
    23
         299 8.6 65 5 7
8
    19
         99 13.8 59 5 8
9
    8
         19 20.1 61
                      5 9
10
    NA
         194 8.6 69 5 10
     7
         NA 6.9 74
11
                      5 11
12
    16
         256 9.7 69 5 12
13
         290 9.2 66
    11
                       5 13
14
    14
         274 10.9 68
                       5 14
15
    18
          65 13.2 58
                       5 15
16
         334 11.5 64 5 16
    14
17
    34
         307 12.0 66 5 17
18
     6
         78 18.4 57
                       5 18
19
    30
         322 11.5 68 5 19
```



20 11 44 9.7 62 5 20 21 1 8 9.7 59 5 21 22 11 320 16.6 73 5 22 23 4 25 9.7 61 5 23 24 32 92 12.0 61 5 24 25 NA 66 16.6 57 5 25 26 NA 266 14.9 58 5 26 27 NA NA 8.0 57 5 27 28 23 13 12.0 67 5 28 29 45 252 14.9 81 5 29 30 115 223 5.7 79 5 30 31 37 279 7.4 76 5 31 32 NA 286 8.6 78 6 1 33 NA 287 9.7 74 6 2 34 NA 242 16.1 67 6 3 35 NA 186 9.2 84 6 4 36 NA 220 8.6 85 6 5 37 NA 264 14.3 79 6 6 38 29 127 9.7 82 6 7 39 NA 273 6.9 87 6 8 40 71 291 13.8 90 6 9 41 39 323 11.5 87 6 10 42 NA 259 10.9 93 6 12 43 NA 250 9.2 92 6 12 44 23 148 8.0 82 6 13 45 NA 332 13.8 80 6 14 46 NA 322 11.5 79 6 16 47 21 191 14.9 77 6 16 48 37 284 20.7 72 6 17 49 20 37 9.2 65 6 18 50 12 120 11.5 73 6 19 51 13 137 10.3 76 6 20 52 NA 150 6.3 77 6 21	
22 11 320 16.6 73 5 22 23 4 25 9.7 61 5 23 24 32 92 12.0 61 5 24 25 NA 66 16.6 57 5 25 26 NA 266 14.9 58 5 26 27 NA NA 8.0 57 5 27 28 23 13 12.0 67 5 28 29 45 252 14.9 81 5 29 30 115 223 5.7 79 5 30 31 37 279 7.4 76 5 31 32 NA 286 8.6 78 6 1 33 NA 287 9.7 74 6 2 34 NA 242 16.1 67 6 3 35 NA 186 9.2 84 6 4 36 NA 220 8.6 85 6 5 37 NA 264 14.3 79 6 6 38 29 127 9.7 82 6 7 39 NA 273 6.9 87 6 8 40 71 291 13.8 90 6 9 41 39 323 11.5 87 6 10 42 NA 259 10.9 93 6 13 43 NA 250 9.2 92 6 12 44 23 148 8.0 82 6 13 45 NA 332 13.8 80 6 14 46 NA 322 11.5 79 6 16 47 21 191 14.9 77 6 16 48 37 284 20.7 72 6 17 49 20 37 9.2 65 6 18 50 12 120 11.5 73 6 19 51 13 137 10.3 76 6 20	
23	
24 32 92 12.0 61 5 24 25 NA 66 16.6 57 5 25 26 NA 266 14.9 58 5 26 27 NA NA 8.0 57 5 27 28 23 13 12.0 67 5 28 29 45 252 14.9 81 5 29 30 115 223 5.7 79 5 30 31 37 279 7.4 76 5 31 32 NA 286 8.6 78 6 1 33 NA 287 9.7 74 6 2 34 NA 242 16.1 67 6 3 35 NA 186 9.2 84 6 4 36 NA 220 8.6 85 6 5 37 NA 264 14.3 79 6 6 38 29 127 9.7 82 6 7 39 NA 273 6.9 87 6 8 40 71 291 13.8 90 6 9 41 39 323 11.5 87 6 10 42 NA 259 10.9 93 6 13 43 NA 250 9.2 92 6 12 44 23 148 8.0 82 6 13 45 NA 332 13.8 80 6 14 46 NA 322 11.5 79 6 16 47 21 191 14.9 77 6 16 48 37 284 20.7 72 6 17 49 20 37 9.2 65 6 18 50 12 120 11.5 73 6 19 51 13 137 10.3 76 6 20	
25 NA 66 16.6 57 5 25 26 NA 266 14.9 58 5 26 27 NA NA 8.0 57 5 27 28 23 13 12.0 67 5 28 29 45 252 14.9 81 5 29 30 115 223 5.7 79 5 30 31 37 279 7.4 76 5 31 32 NA 286 8.6 78 6 1 33 NA 287 9.7 74 6 2 34 NA 242 16.1 67 6 3 35 NA 186 9.2 84 6 4 36 NA 220 8.6 85 6 5 37 NA 264 14.3 79 6 6 3 35 NA 273 6.9 87 6 8 40 71 291 13.8 90 6 9 41 39 323 11.5 87 6 10 42 NA 259 10.9 93 6 12 44 23 148 8.0 82 6 13 45 NA 332 13.8 80 6 14 43 NA 250 9.2 92 6 12 44 23 148 8.0 82 6 13 45 NA 332 13.8 80 6 14 46 NA 322 11.5 79 6 16 48 37 284 20.7 72 6 17 49 20 37 9.2 65 6 18 50 12 120 11.5 73 6 19 51 13 137 10.3 76 6 20	
26 NA 266 14.9 58 5 26 27 NA NA 8.0 57 5 27 28 23 13 12.0 67 5 28 29 45 252 14.9 81 5 29 30 115 223 5.7 79 5 30 31 37 279 7.4 76 5 31 32 NA 286 8.6 78 6 1 33 NA 287 9.7 74 6 2 34 NA 242 16.1 67 6 3 35 NA 186 9.2 84 6 4 36 NA 220 8.6 85 6 5 37 NA 264 14.3 79 6 6 38 29 127 9.7 82 6 7 39 NA 273 6.9 87 6 8 40 71 291 13.8 90 6 9 41 39 323 11.5 87 6 10 42 NA 259 10.9 93 6 12 43 NA 250 9.2 92 6 12 44 23 148 8.0 82 6 13 45 NA 332 13.8 80 6 14 46 NA 322 11.5 79 6 16 47 21 191 14.9 77 6 16 48 37 284 20.7 72 6 17 49 20 37 9.2 65 6 18 50 12 120 11.5 73 6 19 51 13 137 10.3 76 6 20	
27 NA NA 8.0 57 5 27 28 23 13 12.0 67 5 28 29 45 252 14.9 81 5 29 30 115 223 5.7 79 5 30 31 37 279 7.4 76 5 31 32 NA 286 8.6 78 6 1 33 NA 287 9.7 74 6 2 34 NA 242 16.1 67 6 3 35 NA 186 9.2 84 6 4 36 NA 220 8.6 85 6 5 37 NA 264 14.3 79 6 6 38 29 127 9.7 82 6 7 39 NA 273 6.9 87 6 8 40 71 291 13.8 90 6 9 41 39 323 11.5 87 6 10 42 NA 259 10.9 93 6 17 43 NA 250 9.2 92 6 12 44 23 148 8.0 82 6 13 45 NA 332 13.8 80 6 14 46 NA 322 11.5 79 6 18 47 21 191 14.9 77 6 16 48 37 284 20.7 72 6 17 49 20 37 9.2 65 6 18 50 12 120 11.5 73 6 19 51 13 137 10.3 76 6 20	j
28 23 13 12.0 67 5 28 29 45 252 14.9 81 5 29 30 115 223 5.7 79 5 30 31 37 279 7.4 76 5 31 32 NA 286 8.6 78 6 1 33 NA 287 9.7 74 6 2 34 NA 242 16.1 67 6 3 35 NA 186 9.2 84 6 4 36 NA 220 8.6 85 6 5 37 NA 264 14.3 79 6 6 38 29 127 9.7 82 6 7 39 NA 273 6.9 87 6 8 40 71 291 13.8 90 6 9 41 39 323 11.5 87 6 10 42 NA 259 10.9 93 6 12 43 NA 250 9.2 92 6 12 44 23 148 8.0 82 6 13 45 NA 332 13.8 80 6 14 46 NA 322 11.5 79 6 16 47 21 191 14.9 77 6 16 48 37 284 20.7 72 6 17 49 20 37 9.2 65 6 18 50 12 120 11.5 73 6 19 51 13 137 10.3 76 6 20	
29 45 252 14.9 81 5 29 30 115 223 5.7 79 5 30 31 37 279 7.4 76 5 31 32 NA 286 8.6 78 6 1 33 NA 287 9.7 74 6 2 34 NA 242 16.1 67 6 3 35 NA 186 9.2 84 6 4 36 NA 220 8.6 85 6 5 37 NA 264 14.3 79 6 6 38 29 127 9.7 82 6 7 39 NA 273 6.9 87 6 8 40 71 291 13.8 90 6 9 41 39 323 11.5 87 6 10 42 NA 259 10.9 93 6 12 43 NA 250 9.2 92 6 12 44 23 148 8.0 82 6 13 45 NA 332 13.8 80 6 14 46 NA 322 11.5 79 6 18 47 21 191 14.9 77 6 16 48 37 284 20.7 72 6 17 49 20 37 9.2 65 6 18 50 12 120 11.5 73 6 19 51 13 137 10.3 76 6 20	
30 115 223 5.7 79 5 30 31 37 279 7.4 76 5 31 32 NA 286 8.6 78 6 1 33 NA 287 9.7 74 6 2 34 NA 242 16.1 67 6 3 35 NA 186 9.2 84 6 4 36 NA 220 8.6 85 6 5 37 NA 264 14.3 79 6 6 38 29 127 9.7 82 6 7 39 NA 273 6.9 87 6 8 40 71 291 13.8 90 6 9 41 39 323 11.5 87 6 10 42 NA 259 10.9 93 6 12 44 23 148 8.0 82 6 13 45 NA 322 11.5 79 6 15 47 21 191 14.9 77 6 16 48 37 284 20.7 72 6 17 49 20 37 9.2 65 6 18 50 12 120 11.5 73 6 19 51 13 137 10.3 76 6 20	
31 37 279 7.4 76 5 31 32 NA 286 8.6 78 6 1 33 NA 287 9.7 74 6 2 34 NA 242 16.1 67 6 3 35 NA 186 9.2 84 6 4 36 NA 220 8.6 85 6 5 37 NA 264 14.3 79 6 6 38 29 127 9.7 82 6 7 39 NA 273 6.9 87 6 8 40 71 291 13.8 90 6 9 41 39 323 11.5 87 6 10 42 NA 259 10.9 93 6 12 43 NA 250 9.2 92 6 12 44 23 148 8.0 82 6 13 45 NA 332 13.8 80 6 14 46 NA 322 11.5 79 6 18 47 21 191 14.9 77 6 16 48 37 284 20.7 72 6 17 49 20 37 9.2 65 6 18 50 12 120 11.5 73 6 19 51 13 137 10.3 76 6 20	
32 NA 286 8.6 78 6 1 33 NA 287 9.7 74 6 2 34 NA 242 16.1 67 6 3 35 NA 186 9.2 84 6 4 36 NA 220 8.6 85 6 5 37 NA 264 14.3 79 6 6 38 29 127 9.7 82 6 7 39 NA 273 6.9 87 6 8 40 71 291 13.8 90 6 9 41 39 323 11.5 87 6 10 42 NA 259 10.9 93 6 12 43 NA 250 9.2 92 6 12 44 23 148 8.0 82 6 13 45 NA 332 13.8 80 6 14 46 NA 322 11.5 79 6 18 47 21 191 14.9 77 6 16 48 37 284 20.7 72 6 17 49 20 37 9.2 65 6 18 50 12 120 11.5 73 6 19 51 13 137 10.3 76 6 20	
33 NA 287 9.7 74 6 2 34 NA 242 16.1 67 6 3 35 NA 186 9.2 84 6 4 36 NA 220 8.6 85 6 5 37 NA 264 14.3 79 6 6 38 29 127 9.7 82 6 7 39 NA 273 6.9 87 6 8 40 71 291 13.8 90 6 9 41 39 323 11.5 87 6 10 42 NA 259 10.9 93 6 12 43 NA 250 9.2 92 6 12 44 23 148 8.0 82 6 13 45 NA 332 13.8 80 6 14 46 NA 322 11.5 79 6 16 47 21 191 14.9 77 6 16 48 37 284 20.7 72 6 17 49 20 37 9.2 65 6 18 50 12 120 11.5 73 6 19 51 13 137 10.3 76 6 20	
34 NA 242 16.1 67 6 3 35 NA 186 9.2 84 6 4 36 NA 220 8.6 85 6 5 37 NA 264 14.3 79 6 6 38 29 127 9.7 82 6 7 39 NA 273 6.9 87 6 8 40 71 291 13.8 90 6 9 41 39 323 11.5 87 6 10 42 NA 259 10.9 93 6 12 43 NA 250 9.2 92 6 12 44 23 148 8.0 82 6 13 45 NA 332 13.8 80 6 14 46 NA 322 11.5 79 6 18 47 21 191 14.9 77 6 16 48 37 284 20.7 72 6 17 49 20 37 9.2 65 6 18 50 12 120 11.5 73 6 19 51 13 137 10.3 76 6 20	
35 NA 186 9.2 84 6 4 36 NA 220 8.6 85 6 5 37 NA 264 14.3 79 6 6 38 29 127 9.7 82 6 7 39 NA 273 6.9 87 6 8 40 71 291 13.8 90 6 9 41 39 323 11.5 87 6 10 42 NA 259 10.9 93 6 12 43 NA 250 9.2 92 6 12 44 23 148 8.0 82 6 13 45 NA 332 13.8 80 6 14 46 NA 322 11.5 79 6 16 47 21 191 14.9 77 6 16 48 37 284 20.7 72 6 17 49 20 37 9.2 65 6 18 50 12 120 11.5 73 6 19 51 13 137 10.3 76 6 20	
36 NA 220 8.6 85 6 5 37 NA 264 14.3 79 6 6 38 29 127 9.7 82 6 7 39 NA 273 6.9 87 6 8 40 71 291 13.8 90 6 9 41 39 323 11.5 87 6 10 42 NA 259 10.9 93 6 12 43 NA 250 9.2 92 6 12 44 23 148 8.0 82 6 13 45 NA 332 13.8 80 6 14 46 NA 322 11.5 79 6 18 47 21 191 14.9 77 6 16 48 37 284 20.7 72 6 17 49 20 37 9.2 65 6 18 50 12 120 11.5 73 6 19 51 13 137 10.3 76 6 20	
37 NA 264 14.3 79 6 6 38 29 127 9.7 82 6 7 39 NA 273 6.9 87 6 8 40 71 291 13.8 90 6 9 41 39 323 11.5 87 6 10 42 NA 259 10.9 93 6 12 43 NA 250 9.2 92 6 12 44 23 148 8.0 82 6 13 45 NA 332 13.8 80 6 14 46 NA 322 11.5 79 6 15 47 21 191 14.9 77 6 16 48 37 284 20.7 72 6 17 49 20 37 9.2 65 6 18 50 12 120 11.5 73 6 19 51 13 137 10.3 76 6 20	
38 29 127 9.7 82 6 7 39 NA 273 6.9 87 6 8 40 71 291 13.8 90 6 9 41 39 323 11.5 87 6 10 42 NA 259 10.9 93 6 12 43 NA 250 9.2 92 6 12 44 23 148 8.0 82 6 13 45 NA 332 13.8 80 6 12 46 NA 322 11.5 79 6 16 47 21 191 14.9 77 6 16 48 37 284 20.7 72 6 17 49 20 37 9.2 65 6 18 50 12 120 11.5 73 6 19 51 13 137 10.3 76 6 20	
39 NA 273 6.9 87 6 8 40 71 291 13.8 90 6 9 41 39 323 11.5 87 6 10 42 NA 259 10.9 93 6 12 43 NA 250 9.2 92 6 12 44 23 148 8.0 82 6 13 45 NA 332 13.8 80 6 14 46 NA 322 11.5 79 6 15 47 21 191 14.9 77 6 16 48 37 284 20.7 72 6 17 49 20 37 9.2 65 6 18 50 12 120 11.5 73 6 19 51 13 137 10.3 76 6 20	
40 71 291 13.8 90 6 9 41 39 323 11.5 87 6 10 42 NA 259 10.9 93 6 12 43 NA 250 9.2 92 6 12 44 23 148 8.0 82 6 13 45 NA 332 13.8 80 6 14 46 NA 322 11.5 79 6 15 47 21 191 14.9 77 6 16 48 37 284 20.7 72 6 17 49 20 37 9.2 65 6 18 50 12 120 11.5 73 6 19 51 13 137 10.3 76 6 20	
41 39 323 11.5 87 6 10 42 NA 259 10.9 93 6 12 43 NA 250 9.2 92 6 12 44 23 148 8.0 82 6 13 45 NA 332 13.8 80 6 14 46 NA 322 11.5 79 6 15 47 21 191 14.9 77 6 16 48 37 284 20.7 72 6 17 49 20 37 9.2 65 6 18 50 12 120 11.5 73 6 19 51 13 137 10.3 76 6 20	
42 NA 259 10.9 93 6 17 43 NA 250 9.2 92 6 12 44 23 148 8.0 82 6 13 45 NA 332 13.8 80 6 14 46 NA 322 11.5 79 6 15 47 21 191 14.9 77 6 16 48 37 284 20.7 72 6 17 49 20 37 9.2 65 6 18 50 12 120 11.5 73 6 19 51 13 137 10.3 76 6 20	
43 NA 250 9.2 92 6 12 44 23 148 8.0 82 6 13 45 NA 332 13.8 80 6 14 46 NA 322 11.5 79 6 15 47 21 191 14.9 77 6 16 48 37 284 20.7 72 6 17 49 20 37 9.2 65 6 18 50 12 120 11.5 73 6 19 51 13 137 10.3 76 6 20	
44 23 148 8.0 82 6 13 45 NA 332 13.8 80 6 14 46 NA 322 11.5 79 6 15 47 21 191 14.9 77 6 16 48 37 284 20.7 72 6 17 49 20 37 9.2 65 6 18 50 12 120 11.5 73 6 19 51 13 137 10.3 76 6 20	
45 NA 332 13.8 80 6 14 46 NA 322 11.5 79 6 15 47 21 191 14.9 77 6 16 48 37 284 20.7 72 6 17 49 20 37 9.2 65 6 18 50 12 120 11.5 73 6 19 51 13 137 10.3 76 6 20	
46 NA 322 11.5 79 6 15 47 21 191 14.9 77 6 16 48 37 284 20.7 72 6 17 49 20 37 9.2 65 6 18 50 12 120 11.5 73 6 19 51 13 137 10.3 76 6 20	
47 21 191 14.9 77 6 16 48 37 284 20.7 72 6 17 49 20 37 9.2 65 6 18 50 12 120 11.5 73 6 19 51 13 137 10.3 76 6 20	
48 37 284 20.7 72 6 17 49 20 37 9.2 65 6 18 50 12 120 11.5 73 6 19 51 13 137 10.3 76 6 20	
49 20 37 9.2 65 6 18 50 12 120 11.5 73 6 19 51 13 137 10.3 76 6 20	
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51 13 137 10.3 76 6 20	
52 NA 150 6.3 77 6 21	
53 NA 59 1.7 76 6 22	
54 NA 91 4.6 76 6 23	
55 NA 250 6.3 76 6 24	
56 NA 135 8.0 75 6 25	
57 NA 127 8.0 78 6 26	
58 NA 47 10.3 73 6 27	
59 NA 98 11.5 80 6 28	
60 NA 31 14.9 77 6 29	
61 NA 138 8.0 83 6 30	
62 135 269 4.1 84 7 1	
63 49 248 9.2 85 7 2	
64 32 236 9.2 81 7 3	
65 NA 101 10.9 84 7 4	
66 64 175 4.6 83 7 5	
67 40 314 10.9 83 7 6	



68	77	276 5.1 88	7 7
69 70	97	267 6.3 92	7 8
70 74	97	272 5.7 92	7 9
71	85 NA	175 7.4 89	7 10
72 72	NA 10	139 8.6 82 264 14.3 73	7 11
73 74	10 27	264 14.3 73 175 14.9 81	7 12 7 13
7 4 75	NA	291 14.9 91	7 14
76	7	48 14.3 80	7 15
70 77	7 48	260 6.9 81	7 16
78	35	274 10.3 82	7 17
79	61	285 6.3 84	7 18
80	79	187 5.1 87	7 19
81	63	220 11.5 85	7 20
82	16		7 21
83	NA	258 9.7 81	7 22
84	NA	295 11.5 82	7 23
85	80	294 8.6 86	7 24
86	108	223 8.0 85	7 25
87	20	81 8.6 82	7 26
88	52	82 12.0 86	7 27
89	82	213 7.4 88	7 28
90	50	275 7.4 86	7 29
91	64	253 7.4 83	7 30
92	59	254 9.2 81	7 31
93	39	83 6.9 81	8 1
94	9	24 13.8 81	8 2
95	16	77 7.4 82	8 3
96	78	NA 6.9 86	8 4
97	35	NA 7.4 85	8 5
98	66	NA 4.6 87	8 6
99	122	255 4.0 89	8 7
100	89	229 10.3 90	8 8
101	110	207 8.0 90	8 9
102	NA	222 8.6 92	8 10
103	NA	137 11.5 86	8 11
104	44	192 11.5 86	8 12
105	28	273 11.5 82	8 13
106	65	157 9.7 80	8 14
107	NA	64 11.5 79	8 15
108	22	71 10.3 77	8 16
109	59	51 6.3 79	8 17
110	23	115 7.4 76	8 18
111	31	244 10.9 78	8 19
112	44	190 10.3 78	8 20
113	21	259 15.5 77	8 21
114	9	36 14.3 72	8 22
115	NA	255 12.6 75	8 23



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116
    45
          212 9.7 79
                       8 24
117
    168
          238 3.4 81
                        8 25
118
     73
          215 8.0 86
                       8 26
119
    NA
          153 5.7 88
                        8 27
120
     76
          203 9.7 97
                        8 28
121
          225 2.3 94
                        8 29
    118
122
     84
          237 6.3 96
                        8 30
123
     85
          188 6.3 94
                        8 31
124
          167 6.9 91
     96
                       9 1
125
          197 5.1 92
                        9 2
     78
126
     73
          183 2.8 93
                       9 3
127
     91
          189 4.6 93
                       9 4
128
          95 7.4 87
     47
                       9 5
129
     32
          92 15.5 84
                       9 6
130
     20
          252 10.9 80
                        9 7
131
     23
          220 10.3 78
                        9 8
132
     21
          230 10.9 75
                        9 9
133
          259 9.7 73
     24
                        9 10
134
     44
          236 14.9 81
                        9 11
135
     21
          259 15.5 76
                        9 12
136
     28
          238 6.3 77
                       9 13
137
          24 10.9 71
     9
                       9 14
138
     13
          112 11.5 71
                        9 15
139
     46
          237 6.9 78
                       9 16
140
     18
          224 13.8 67
                        9 17
141
     13
          27 10.3 76
                        9 18
142
     24
          238 10.3 68
                        9 19
143
          201 8.0 82
     16
                        9 20
144
     13
          238 12.6 64
                        9 21
145
     23
          14 9.2 71
                       9 22
          139 10.3 81
146
     36
                        9 23
147
          49 10.3 69
                       9 24
     7
148
     14
          20 16.6 63
                       9 25
149
     30
          193 6.9 70
                       9 26
150
     NA
          145 13.2 77
                        9 27
151
          191 14.3 75
                        9 28
     14
152
     18
          131 8.0 76
                        9 29
     20
153
          223 11.5 68
                        9 30
> print(aq)
```

Ozone Solar.R Wind Temp Month Day

- 190 7.4 67 1 41 5 1 2 118 8.0 72 36 5 2 3 12 149 12.6 74 5 3 313 11.5 62 4 18 5 4 5 NA 14.3 56 5 5 NA 6 28 NA 14.9 66 5 6
- 7 23 299 8.6 65 5 7 8 19 99 13.8 59 5 8



9	8	19 20.1 61 5 9
10	NA	194 8.6 69 5 10
11	7	NA 6.9 74 5 11
12	16	256 9.7 69 5 12
13	11	290 9.2 66 5 13
14	14	274 10.9 68 5 14
15	18	65 13.2 58 5 15
16	14	334 11.5 64 5 16
17	34	307 12.0 66 5 17
18	6	78 18.4 57 5 18
19	30	322 11.5 68 5 19
20	11	44 9.7 62 5 20
21	1	8 9.7 59 5 21
22	11	320 16.6 73 5 22
23	4	25 9.7 61 5 23
24	32	92 12.0 61 5 24
25	NA	66 16.6 57 5 25
26	NA	266 14.9 58 5 26
27	NA	NA 8.0 57 5 27
28	23	13 12.0 67 5 28
29	45	252 14.9 81 5 29
30	115	223 5.7 79 5 30
31	37	279 7.4 76 5 31
32	NA	286 8.6 78 6 1
33	NA	287 9.7 74 6 2
34	NA	242 16.1 67 6 3
35	NA	186 9.2 84 6 4
36	NA	220 8.6 85 6 5
37	NA	264 14.3 79 6 6
38	29	127 9.7 82 6 7
39	NA	273 6.9 87 6 8
40	71	291 13.8 90 6 9
41	39	323 11.5 87 6 10
42	NA	259 10.9 93 6 11
43	NA	250 9.2 92 6 12
44	23	148 8.0 82 6 13
45	NA	332 13.8 80 6 14
46	NA	322 11.5 79 6 15
47	21	191 14.9 77 6 16
48	37	284 20.7 72 6 17
49	20	37 9.2 65 6 18
50	12	120 11.5 73 6 19
51	13	137 10.3 76 6 20
52	NA	150 6.3 77 6 21
53	NA	59 1.7 76 6 22
54	NA	91 4.6 76 6 23
55	NA	250 6.3 76 6 24
56	NA	135 8.0 75 6 25



57	NA	127 8.0 78 6 26
58	NA	47 10.3 73 6 27
59	NA	98 11.5 80 6 28
60	NA	31 14.9 77 6 29
61	NA	138 8.0 83 6 30
62	135	269 4.1 84 7 1
63	49	248 9.2 85 7 2
64	32	236 9.2 81 7 3
65	NA	101 10.9 84 7 4
66	64	175 4.6 83 7 5
67	40	314 10.9 83 7 6
68	77	276 5.1 88 7 7
69	97	267 6.3 92 7 8
70	97	272 5.7 92 7 9
71	85	175 7.4 89 7 10
72	NA	139 8.6 82 7 11
73	10	264 14.3 73 7 12
74	27	175 14.9 81 7 13
75	NA	291 14.9 91 7 14
76	7	48 14.3 80 7 15
77	48	260 6.9 81 7 16
78	35	274 10.3 82 7 17
79	61	285 6.3 84 7 18
80	79	187 5.1 87 7 19
81	63	220 11.5 85 7 20
82	16	7 6.9 74 7 21
83	NA	258 9.7 81 7 22
84	NA	295 11.5 82 7 23
85	80	294 8.6 86 7 24
86	108	223 8.0 85 7 25
87	20	81 8.6 82 7 26
88	52	82 12.0 86 7 27
89	82	213 7.4 88 7 28
90	50	275 7.4 86 7 29
91	64	253 7.4 83 7 30
92	59	254 9.2 81 7 31
93	39	83 6.9 81 8 1
94	9	24 13.8 81 8 2
95	16	77 7.4 82 8 3
96	78	NA 6.9 86 8 4
97	35	NA 7.4 85 8 5
98	66	NA 4.6 87 8 6
99	122	255 4.0 89 8 7
100	89	229 10.3 90 8 8
101	110	207 8.0 90 8 9
102	NA	222 8.6 92 8 10
103	NA	137 11.5 86 8 11
104	44	192 11.5 86 8 12
	1 T	.020 00 0 12



105	28	273 11.5 82	8 13
106	65	157 9.7 80	8 14
107	NA	64 11.5 79	8 15
108	22	71 10.3 77	8 16
109	59	51 6.3 79	8 17
110	23	115 7.4 76	8 18
111	31	244 10.9 78	8 19
112	44	190 10.3 78	8 20
113	21	259 15.5 77	8 21
114	9	36 14.3 72	8 22
115	NA	255 12.6 75	8 23
116	45	212 9.7 79	8 24
117	168	238 3.4 81	8 25
118	73	215 8.0 86	8 26
119	NA	153 5.7 88	8 27
120	76	203 9.7 97	8 28
121	118	225 2.3 94	8 29
122	84	237 6.3 96	8 30
123	85	188 6.3 94	8 31
124	96	167 6.9 91	9 1
125	78	197 5.1 92	9 2
126	73	183 2.8 93	9 3
127	91	189 4.6 93	9 4
128	47	95 7.4 87	9 5
129	32	92 15.5 84	9 6
130	20	252 10.9 80	9 7
131	23	220 10.3 78	9 8
132	21	230 10.9 75	9 9
133	24	259 9.7 73	9 10
134	44	236 14.9 81	9 11
135	21	259 15.5 76	9 12
136	28	238 6.3 77	9 13
137	9	24 10.9 71	9 14
138	13	112 11.5 71	9 15
139	46	237 6.9 78	9 16
140	18	224 13.8 67	9 17
141	13	27 10.3 76	9 18
142	24	238 10.3 68	9 19
143	16	201 8.0 82	9 20
144	13	238 12.6 64	9 21
145	23	14 9.2 71	9 22
146	36	139 10.3 81	9 23
147	7	49 10.3 69	9 24
148	14	20 16.6 63	9 25
149	30	193 6.9 70	9 26
150	NA	145 13.2 77	9 27
151	14	191 14.3 75	9 28
152	18	131 8.0 76	9 29



```
153
     20
          223 11.5 68 9 30
>
> str(aq)
'data.frame': 153 obs. of 6 variables:
$ Ozone: int 41 36 12 18 NA 28 23 19 8 NA ...
$ Solar.R: int 190 118 149 313 NA NA 299 99 19 194 ...
$ Wind: num 7.4 8 12.6 11.5 14.3 14.9 8.6 13.8 20.1 8.6 ...
$ Temp : int 67 72 74 62 56 66 65 59 61 69 ...
$ Month: int 5555555555...
$ Day : int 12345678910...
> summary(aq)
              Solar.R
                          Wind
  Ozone
Min.: 1.00 Min.: 7.0 Min.: 1.700
1st Qu.: 18.00 1st Qu.:115.8 1st Qu.: 7.400
Median: 31.50 Median: 205.0 Median: 9.700
Mean: 42.13 Mean: 185.9 Mean: 9.958
3rd Qu.: 63.25 3rd Qu.:258.8 3rd Qu.:11.500
Max. :168.00 Max. :334.0 Max. :20.700
NA's :37
            NA's :7
   Temp
              Month
                         Day
Min. :56.00 Min. :5.000 Min. : 1.0
1st Qu.:72.00 1st Qu.:6.000 1st Qu.: 8.0
Median: 79.00 Median: 7.000 Median: 16.0
Mean :77.88 Mean :6.993 Mean :15.8
3rd Qu.:85.00 3rd Qu.:8.000 3rd Qu.:23.0
Max. :97.00 Max. :9.000 Max. :31.0
> tail(aq)
  Ozone Solar.R Wind Temp Month Day
148
    14
          20 16.6 63
                       9 25
149
     30
          193 6.9 70
                       9 26
150 NA
         145 13.2 77
                       9 27
151
    14
          191 14.3 75
                        9 28
152
    18
          131 8.0 76
                       9 29
153
     20
          223 11.5 68 9 30
>
> head(aq)
 Ozone Solar.R Wind Temp Month Day
1 41
        190 7.4 67
                     5 1
2 36
                     5 2
       118 8.0 72
3 12
       149 12.6 74
                    5 3
4 18
        313 11.5 62
                     5 4
5 NA NA 14.3 56 5 5
```



```
6
   28
         NA 14.9 66 5 6
>
>
> aq[is.na(aq)] <- 0
> summary(aq)
  Ozone
               Solar.R
                            Wind
Min.: 0.00 Min.: 0.0 Min.: 1.700
1st Qu.: 4.00 1st Qu.: 95.0 1st Qu.: 7.400
Median: 21.00 Median: 194.0 Median: 9.700
Mean: 31.94 Mean: 177.4 Mean: 9.958
3rd Qu.: 46.00 3rd Qu.:256.0 3rd Qu.:11.500
Max. :168.00 Max. :334.0 Max. :20.700
   Temp
              Month
                           Day
Min. :56.00 Min. :5.000 Min. : 1.0
1st Qu.:72.00 1st Qu.:6.000 1st Qu.: 8.0
Median: 79.00 Median: 7.000 Median: 16.0
Mean :77.88 Mean :6.993 Mean :15.8
3rd Qu.:85.00 3rd Qu.:8.000 3rd Qu.:23.0
Max. :97.00 Max. :9.000 Max. :31.0
> x <- c(3,4,5,6,7,8)
> x[x>4 \& x<8] <-NA
> x <- c(3,4,5,6,7,8)
> x[x>4 & x<8] <- "NA"
[1] "3" "4" "NA" "NA" "NA" "8"
> x[x<5 | x>6]<- "NA"
> X
Error: object 'X' not found
>
> x[x<5 | x>6]<- "NA"
[1] "NA" "NA" "NA" "NA" "NA" "NA"
> x < -c(3,4,5,6,7,8)
> x[x<5 | x>6]<- "NA"
> X
[1] "NA" "NA" "5" "6" "NA" "NA"
> mean(x, na.rm=TRUE)
[1] NA
Warning message:
In mean.default(x, na.rm = TRUE):
 argument is not numeric or logical: returning NA
>
```



```
> x=as.integer(x)
Warning message:
NAs introduced by coercion
>
>
> colSums(is.na(aq))
 Ozone Solar.R Wind
                      Temp Month
                                    Day
       0
            0
                 0
                           0
>
> colSums(is.na(airquality))
 Ozone Solar.R Wind Temp Month
                                    Day
             0
                       0
  37
        7
                  0
                            0
>
> datasets::airquality
  Ozone Solar.R Wind Temp Month Day
1
    41
         190 7.4 67
                      5 1
2
    36
         118 8.0 72
                      5 2
3
    12
         149 12.6 74
                       5
4
    18
         313 11.5 62
                       5 4
5
    NA
         NA 14.3 56
                      5 5
6
    28
         NA 14.9 66
                       5 6
7
    23
         299 8.6 65
                      5 7
8
    19
         99 13.8 59
                      5 8
9
    8
         19 20.1 61
                      5 9
10
    NA
         194 8.6 69
                       5 10
11
     7
         NA 6.9 74
                      5 11
12
         256 9.7 69
                       5 12
    16
13
         290 9.2 66
    11
                       5 13
14
    14
         274 10.9 68
                       5 14
15
    18
          65 13.2 58
                       5 15
16
    14
         334 11.5 64
                       5 16
17
    34
         307 12.0 66
                       5 17
18
     6
         78 18.4 57
                      5 18
19
    30
         322 11.5 68
                       5 19
         44 9.7 62
20
    11
                      5 20
21
          8 9.7 59
                     5 21
     1
22
         320 16.6 73
    11
                       5 22
23
                      5 23
     4
         25 9.7 61
24
    32
          92 12.0 61
                       5 24
25
          66 16.6 57
                       5 25
    NA
26
    NA
          266 14.9 58
                       5 26
27
          NA 8.0 57
    NA
                       5 27
28
    23
          13 12.0 67
                       5 28
29
         252 14.9 81
                       5 29
    45
30
    115
         223 5.7 79
                       5 30
31
    37
         279 7.4 76
                       5 31
32
    NA
          286 8.6 78
                       6 1
33
    NA
          287 9.7 74
                       6 2
```



34	NA	242 16.1 67	6 3
35	NA	186 9.2 84	6 4
36	NA	220 8.6 85	6 5
37	NA	264 14.3 79	6 6
38	29	127 9.7 82	6 7
39	NA	273 6.9 87	6 8
40	71	291 13.8 90	6 9
41	39	323 11.5 87	6 10
42	NA	259 10.9 93	6 11
43	NA	250 9.2 92	6 12
44	23	148 8.0 82	6 13
45	NA	332 13.8 80	6 14
46	NA	322 11.5 79	6 15
47	21	191 14.9 77	6 16
48	37	284 20.7 72	6 17
49	20	37 9.2 65	6 18
50	12	120 11.5 73	6 19
51	13	137 10.3 76	6 20
52	NA	150 6.3 77	6 21
53	NA	59 1.7 76	6 22
54	NA	91 4.6 76	6 23
55	NA	250 6.3 76	6 24
56	NA	135 8.0 75	6 25
57	NA	127 8.0 78	6 26
58	NA	47 10.3 73	6 27
59	NA	98 11.5 80	6 28
60	NA	31 14.9 77	6 29
61	NA	138 8.0 83	6 30
62	135	269 4.1 84	7 1
63	49	248 9.2 85	7 2
64	32	236 9.2 81	7 3
65	NA	101 10.9 84	7 4
66	64	175 4.6 83	7 5
67	40	314 10.9 83	7 6
68	77	276 5.1 88	7 7
69	97	267 6.3 92	7 8
70	97	272 5.7 92	7 9
71	85	175 7.4 89	7 10
72	NA	139 8.6 82	7 11
73	10	264 14.3 73	7 12
74	27	175 14.9 81	7 13
75	NA	291 14.9 91	7 14
76	7	48 14.3 80	7 15
77	48	260 6.9 81	7 16
78	35	274 10.3 82	7 17
79	61	285 6.3 84	7 18
80	79	187 5.1 87	7 19
81	63	220 11.5 85	7 20



82	16	7 6.9 74 7 21
83	NA	258 9.7 81 7 22
84	NA	295 11.5 82 7 23
85	80	294 8.6 86 7 24
86	108	223 8.0 85 7 25
87	20	81 8.6 82 7 26
88	52	82 12.0 86 7 27
89	82	213 7.4 88 7 28
90	50	275 7.4 86 7 29
91	64	253 7.4 83 7 30
92	59	254 9.2 81 7 31
93	39	83 6.9 81 8 1
94	9	24 13.8 81 8 2
95	16	77 7.4 82 8 3
96	78	NA 6.9 86 8 4
97	35	NA 7.4 85 8 5
98	66	NA 4.6 87 8 6
99	122	255 4.0 89 8 7
100	89	229 10.3 90 8 8
101	110	207 8.0 90 8 9
102	NA	222 8.6 92 8 10
103	NA	137 11.5 86 8 11
104	44	192 11.5 86 8 12
105	28	273 11.5 82 8 13
106	65	157 9.7 80 8 14
107	NA	64 11.5 79 8 15
108	22	71 10.3 77 8 16
109	59	51 6.3 79 8 17
110	23	115 7.4 76 8 18
111	31	244 10.9 78 8 19
112	44	190 10.3 78 8 20
113	21	259 15.5 77 8 21
114	9	36 14.3 72 8 22
115	NA	255 12.6 75 8 23
116	45	212 9.7 79 8 24
117	168	238 3.4 81 8 25
118	73	215 8.0 86 8 26
119	NA	153 5.7 88 8 27
120	76	203 9.7 97 8 28
121	118	225 2.3 94 8 29
122	84	237 6.3 96 8 30
123	85	188 6.3 94 8 31
124	96	167 6.9 91 9 1
125	78	197 5.1 92 9 2
126	73	183 2.8 93 9 3
127	91	189 4.6 93 9 4
128	47	95 7.4 87 9 5
129	32	92 15.5 84 9 6



```
130
    20
         252 10.9 80
                      9 7
131
    23
         220 10.3 78
                      9 8
132
    21
         230 10.9 75
                      9 9
133
    24
         259 9.7 73
                      9 10
134
    44
         236 14.9 81
                      9 11
135
    21
         259 15.5 76
                      9 12
136
    28
         238 6.3 77
                      9 13
137
     9
         24 10.9 71
                     9 14
138
    13
         112 11.5 71
                      9 15
139
    46
         237 6.9 78
                      9 16
140
    18
         224 13.8 67
                      9 17
141
    13
         27 10.3 76
                      9 18
142
    24
         238 10.3 68
                      9 19
143
    16
         201 8.0 82
                      9 20
144
    13
         238 12.6 64
                      9 21
145
    23
         14 9.2 71
                     9 22
146
    36
         139 10.3 81
                      9 23
147
     7
         49 10.3 69
                     9 24
148
    14
         20 16.6 63
                     9 25
149
    30
         193 6.9 70
                      9 26
                      9 27
150
    NA
         145 13.2 77
151
                      9 28
    14
         191 14.3 75
152
    18
         131 8.0 76
                      9 29
153
    20
         223 11.5 68
                      9 30
>
> data(airquality)
>
> ?airquality
>
> aq$Solar.R=cut(aq$Solar.R,breaks=brks,include.lowest=TRUE)
Error in cut.default(aq$Solar.R, breaks = brks, include.lowest = TRUE):
object 'brks' not found
>
>
>
> mean(airquality$Ozone, na.rm = TRUE)
[1] 42.12931
> airquality[is.na(airquality$Ozone)]
Error in `[.data.frame`(airquality, is.na(airquality$Ozone)):
undefined columns selected
>
> airquality$Ozone[is.na(airquality$Ozone)]
[35] NA NA NA
```

19BCE7346 > aq\$Ozone[is.na(aq\$Ozone)] <- mean(airquality\$Ozone, na.rm = TRUE) > summary(aq) Wind Ozone Solar.R Min.: 0.00 Min.: 0.0 Min.: 1.700 1st Qu.: 4.00 1st Qu.: 95.0 1st Qu.: 7.400 Median: 21.00 Median: 194.0 Median: 9.700 Mean: 31.94 Mean: 177.4 Mean: 9.958 3rd Qu.: 46.00 3rd Qu.:256.0 3rd Qu.:11.500 Max. :168.00 Max. :334.0 Max. :20.700 Temp Month Day Min. :56.00 Min. :5.000 Min. : 1.0 1st Qu.:72.00 1st Qu.:6.000 1st Qu.: 8.0 Median: 79.00 Median: 7.000 Median: 16.0 Mean :77.88 Mean :6.993 Mean :15.8

3rd Qu.:85.00 3rd Qu.:8.000 3rd Qu.:23.0 Max. :97.00 Max. :9.000 Max. :31.0

> summary(aq\$Ozone)

Min. 1st Qu. Median Mean 3rd Qu. Max. 0.00 4.00 21.00 31.94 46.00 168.00

> summary(airquality\$Ozone)

Min. 1st Qu. Median Mean 3rd Qu. Max. NA's 1.00 18.00 31.50 42.13 63.25 168.00 37